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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/718,897	11/20/2003	Shao-Chung Hu	JCLA11797	1661

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EXAMINER	
ROSE, KIESHA L	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 09/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/718,897	HU ET AL.	
	Examiner	Art Unit	
	Kiesha L. Rose	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-20,22 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-20 and 22-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the amendment filed 5 July 2006.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 15-20 and 22-23 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the first film layer comprised of an conductive material, does not reasonably provide enablement for the first film layer comprised of a non-conductive material. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. Claims 15-20 disclose a first protective layer, formed on the surface of the first metal layer not covered by the first dielectric layer, wherein the first protective layer is formed from a mixture of the first metal layer and a first film layer, **the first film layer is reactive with the first metal layer but non- reactive with the first dielectric layer**, and a top surface of the first dielectric layer around the first opening is exposed, **wherein the first film laver is comprised of a non-conductive material**. The specification disclose the materials that are to be used if the first film layer is a conductive material but does not disclose the materials to be used if the first film layer is a non-conducting material. Since the first

film layer is suppose to be reactive with the first metal layer but non-reactive with the first dielectric layer, it is unclear what non-conducting materials would produce this function, since the first film layer is mixed with the metal layer to form the protective layer. It is unclear whether any dielectric, insulating or non-conducting layer would react to the metal layer and first dielectric layer as claimed.

For examining purposes the claim is being read as:

A first dielectric layer, having a first opening therein; a first metal layer, formed in the first opening; and a first protective layer, formed on the surface of the first metal layer not covered by the first dielectric layer, wherein the first protective layer is formed from a mixture of the first metal layer and a first film layer, the first film layer is reactive with the first metal layer but non- reactive with the first dielectric layer, and a top surface of the first dielectric layer around the first opening is exposed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 15 and 16, as far as understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Besser et al. (U.S. Patent 6,689,689).

In re claim 15, Besser discloses a damascene interconnect (Fig. 2) that contains a first dielectric layer (3), having a first opening (2) therein, a first metal layer (5), formed in the first opening and a first protective layer (7/8), formed on the surface of the first metal layer not covered by the first dielectric layer, wherein the first protective layer is formed from a mixture of the first metal layer and a first film layer (7/8), the first film layer is reactive with the first metal layer but non-reactive with the first dielectric layer and a top surface of the first dielectric layer around the first opening is exposed. (Column 7, lines 18-35 and Column 10, lines 41-67)

In re claim 16, the first metal layer is copper. (Column 9, lines 36-37)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 17-20 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Besser as applied to claim 15 above, and further in view of Maiz et al. (U.S. Patent 6,794,755).

In re claim 17, Besser discloses all the limitations except for a first stop layer. Whereas Maiz discloses a interconnect structure (Fig. 2g) that contains a first stop layer

(244) on the surface of the first dielectric layer (210) with the first opening formed in the first dielectric and the first stop layer. The first stop layer is formed to protect the copper interconnect during subsequent etch and cleaning procedures and to stop etchant and cleaning chemicals. (Column 6, lines 65-67 and Column 7, lines 1;2 and 7-9) Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Besser by incorporating a first stop layer to protect the copper interconnect during subsequent etch and cleaning procedures and to stop etchant and cleaning chemicals as taught by Maiz.

In re claim 18, Maiz discloses a second dielectric (246), formed over first dielectric (210), wherein the second dielectric layer has a second opening therein cutting through the first protective layer (216) to expose first metal layer (224), a second metal layer (280), being filled into the second opening, a second protective layer (interconnect structures can be formed of subsequent interconnect structures that would have the same layers as the first interconnect structure with the second protective layer. (Column 7, lines 53-55)), formed on the surface of the second metal layer not covered by the second dielectric. (Fig. 2g)

In re claim 19, Maiz discloses the second metal layer being copper. (Second metal layer is the same material as the first metal layer, Column 3, lines 28-30)

In re claim 20, Maiz discloses a second stop layer on the surface of the second dielectric layer, wherein the second opening is formed in the first dielectric and the second stop layer. (Addition interconnect structures can be formed of subsequent

interconnect structures that would have the same layers as the first interconnect structures with a second stop layer. (Column 7, lines 53-55))

In re claims 22 and 23, Besser and Maiz disclose the second protective layer formed from a mixture of the second metal layer and a second film layer and the second film layer is reactive with the second metal layer but non-reactive with the second dielectric. Besser discloses a first film that is reactive with the first metal layer and non-reactive with the first dielectric and Besser discloses that subsequent layers can be formed, which would be another interconnect layer with second protective layer and second film layer (Column 11, lines 8-11) and where the second film layer would be formed of a conductive material as the first film layer. (Column 7, lines 18-23) In addition Maiz discloses subsequent interconnect structures where the first and second protective layers can be formed on the first and second metal layers with first and second film layers. (Column 7, lines 53-55)

Response to Arguments

Applicant's arguments with respect to claims 15-20 and 22-23 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kiesha L. Rose whose telephone number is 571-272-1844. The examiner can normally be reached on T-F 8:30-6:00 off Mondays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Zandra V. Smith
Supervisory Patent Examiner
18 Sept. 2010

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.